

REMARKS

In response to the Official Action mailed on June 22, 2006, the application has been amended. No new matter has been added. Reconsideration of the rejections of the claims is respectfully requested in view of the above amendments and the following remarks.

On page 2 of the Official Action, claims 12 - 16 were rejected under 35 USC 103(a) as obvious over JP 08-001373 by Shozo Nagai et al (which will be referred to below as Nagai). This rejection is respectfully traversed,

Claim 12 has been cancelled, and claim 13 has been rewritten as an independent claims including all the features of claim 12. Claim 13 recites a lead-free solder alloy containing a nonzero Ni content of at most 0.3 wt %. Nagai does not disclose or suggest such a composition.

Nagai discloses a brazing filler metal for use in brazing of stainless steel in a vacuum furnace without the use of flux. The filler metal may contain 0.5 - 5.0 weight % of Ni. There is no suggestion in Nagai of a Ni content of less than 0.5 weight %. Paragraph 0008 of Nagai specifically states that the addition of Ni has little effect when its content is less than 0.5 %, and Table 2 of Nagai shows that Comparative Example d had poor results with a Ni content of 0.3 %. Thus, Nagai clearly teaches away from a composition having a Ni content of less than 0.5 weight %.

Therefore, as the prior art cited in the Official Action

does not provide any motivation to modify Nagai to employ an Ni content of at most 0.3 weight % as set forth in claim 13, the rejection of claims 13 - 16 fails to set forth a *prima facie* case of obviousness. Claim 13 and claims 14 - 16 which depend from it are thus allowable.

Claim 15 further patentably distinguishes the present invention from Nagai. Claim 15 states that the P content of the alloy of claim 13 is 0.001 - 0.01 weight %. In Nagai, the lower limit for the P content is set at 0.05 %. According to paragraph 0007 of Nagai,

When P is added to and alloyed with the brazing material, it forms phosphorus compounds (Sn_4P_3 , Ni_3P , Cu_3P , AgP , etc.) with each of the components and exhibits a self-fluxing action during brazing, and it has the effect of improving wettability by breaking down a strong oxide film on the surface of stainless steel, but it cannot exhibit these effects at less than 0.05 %, while if it exceeds 1.5 %, the above effects slow down, and a possibility develops of vaporization of P during vacuum brazing. Therefore, the range of addition of P is limited to 0.05 - 1.5%.

Therefore, Nagai clearly prohibits a P content of less than 0.05 % and so provides no suggestion of a P content as set forth in claim 15.

Claim 16 further patentably distinguishes the present invention from Nagai. Claim 16 describes a solder paste comprising the solder alloy of claim 13. There is no suggestion in Nagai of using the brazing filler metal which it discloses in the form of a paste. Nagai repeatedly states that the purpose of its invention is to provide a filler material which can be used for vacuum brazing without a flux. Since the brazing filler

metal of Nagai is never intended to be used with a flux, it is of course never intended to be used in the form of a paste, which naturally entails use of a flux.

Regarding claim 16, page 2 of the Official Action states that "Forming the solders of cited references into a solder paste is contemplated within ambit of ordinary skill artisan", which presumably means that a person of skill in the art would have no difficulty in forming a paste from the brazing filler metal of Nagai. However, the ability to modify a reference in a certain manner does not establish a motivation for doing so. Nowhere does Nagai teach that its brazing filler metal is suitable for use in the form of a paste, and the Official Action cites no other teachings that would motivate a person of skill in the art to use the material of Nagai as a paste. Therefore, since the Official Action does not set forth any teachings that provide any motivation for modification of Nagai, it does not set forth a *prima facie* case of obviousness with respect to claim 16.

On page 3 of the Official Action, claims 17 - 19 were rejected as unpatentable over Nagai as applied to claims 12 - 16 and further in view of Gontier (U.S. Patent No. 4,858,816). This rejection is respectfully traversed.

Claims 17 - 19, which have been amended to depend from claim 13, are firstly allowable because they depend upon claim 13 and employ the solder alloy of claim 13. As set forth above, there is no suggestion in Nagai of a solder alloy having a composition as set forth in claim 13. Gontier is relied upon as teaching a

soldering machine for use in soldering of a molten tin-containing solder alloy. However, Gontier does not disclose any specific solder composition, and certainly does not disclose a solder alloy as set forth in claim 13, so it does not make up for the deficiencies of Nagai in this regard. Therefore, even if Nagai were modified by Gontier as proposed by the Official Action, it would not result in a flow soldered joint or a flow soldering method as set forth in claims 17 - 19.

Amended claims 17 - 19 are further allowable because the cited references do not suggest the use of a solder alloy set forth in these claims. Amended claim 17 describes a flow soldered joint connected to an electronic component using the solder alloy of claim 13, and amended claim 18 describes a soldering method including contacting an electronic component with the solder of claim 13 in a molten state. Amended claim 19, which depends from claim 18, specifies that the electronic component referred to in claim 18 is contacted with a solder wave. Amended claims 17 - 19 are supported by page 6, lines 18 - 19 of the specification as filed, which state that the present invention is particularly suitable for wave soldering of electronic components to printed wiring boards.

There is no suggestion in either of the cited references of using the brazing filler metal disclosed in Nagai for flow soldering and particularly for flow soldering of an electronic component. Gontier was relied upon in the Official Action as supposedly providing motivation to a person skilled in the art to employ the brazing filler metal of Nagai for flow soldering, but

Gontier merely teaches a method of wave soldering using a wave barrier. As stated above, Gontier does not teach any specific solder compositions, and it nowhere suggests that every possible alloy is suitable for flow soldering. Note that in column 2, lines 14 - 16, Gontier states that the tin solder which is used for flow soldering is not just any meltable solder alloy but rather any appropriate solder alloy, clearly implying that there exist inappropriate solder alloys. As such, there is nothing in Gontier to suggest using the brazing filler metal of Nagai for flow soldering.

As for Nagai, there is no disclosure of the exact method of brazing with which it is intended to be employed, and there is certainly no suggestion of using it for flow soldering. In particular, it contains no suggestion that it has any suitability for soldering of electronic components. Nagai repeatedly sets forth that its purpose is to braze stainless steel, that the brazing is performed in a vacuum, that the brazing is performed without use of a flux, and that the brazing is performed at a "low temperature" of 500 - 600°C. For example, paragraph 0004 of Nagai states that

The object of the present invention is to provide a low melting point brazing material not existing in the past which exhibits good wettability and flowability with respect to a material such as stainless steel which form a strong oxide layer on its surface without vaporization of component elements at a low temperature of 500 - 600°C in vacuum brazing in which flux cannot be used.

This "low temperature" is at least 250°C higher than the maximum acceptable temperature for soldering of electronic

components to printed wiring boards. Furthermore, while paragraph 0004 of Nagai states its object is to provide a brazing material with good wettability and flowability, these properties are exhibited in the range of 500 - 600°, and there is no indication that the brazing filler metal of Nagai exhibits any such properties at the far lower temperatures at which flow soldering of electronic components must take place.

Note that in paragraph 0012 of Nagai, which describes a brazing test in which spreadability of the brazing filler metal is measured, the filler metal is heated to 600°C for 30 minutes. No such conditions could exist during flow soldering of electronic components to a printed wiring board, so there is no reason to think that the brazing filler metal disclosed in Nagai would exhibit desirable properties during such flow soldering.

As such, there is nothing in either reference to suggest that the brazing filler metal of Nagai has any suitability for flow soldering of electronic components, and so there is no motivation to modify Nagai to perform flow soldering as set forth in amended claims 17 - 19. Accordingly, the Official Action does not set forth a *prima facie* case of obviousness of these claims. Claims 17 - 19 are accordingly allowable.

Claims 20 - 31, which were withdrawn from consideration, have been cancelled so as to reduce claim fees, while new claims 32 - 36 have been added to describe additional features of the present invention. Claims 32 and 33 are allowable as depending from claims 17 and 18, respectively. Claim 34 describes a method

of flow soldering including contacting an electronic component with a molten solder of the solder recited in canceled claim 12. As set forth above with respect to claim 18, there is no suggestion in either of the cited references of employing the composition disclosed in Nagai for flow soldering and particularly for flow soldering of electronic components. Claim 34 and claims 35 - 36 which depend from it are therefore allowable.

The Applicants have noted the comments on page 4 of the Official Action concerning the declaration of commercial success filed on April 18, 2005 in connection with the present application. The Applicants are in the process of obtaining further declarations to show that the very significant commercial success which has been experienced by a commercial product described by the pending claims is the result of the attributes of the claimed composition and not due to other factors. Due to the busy schedules of the inventors, it has taken longer than anticipated to compile the necessary information, but the Applicants hope to be able to present suitable supplemental declarations in the near future.

In light of the foregoing remarks, it is believed that the

present application is in condition for allowance. Favorable consideration is respectfully requested.

Respectfully submitted,

A handwritten signature in cursive script that reads "Michael Tobias".

Michael Tobias
Registration Number 32,948

#40
1717 K Street, N.W., Suite 613
Washington, D.C. 20036
Telephone: (301) 587-6541
Facsimile: (301) 587-6623
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